REMARKS

Claims 1-32 remain pending in the application after entry of this amendment. Claims 1, 4, 13, 15, 16, 18, 28, and 32 have been amended as shown above. The claims were amended to more fully clarify the invention. Favorable reconsideration is respectfully requested in light of the above amendments and the following comments.

The Examiner rejected claims 4, 5, and 13-31 under 35 U.S.C. § 112, second paragraph as being indefinite. Applicants respectfully traverse this rejection.

The Examiner rejected claims 1-5, 13, 15-19, and 27 under 35 U.S.C. § 102(b) as being anticipated by Olbright (U.S. Patent No. 5,283,447). Applicants respectfully traverse this rejection.

The Examiner rejected claims 28-32 under 35 U.S.C. § 102(a) as being anticipated by Floyd (U.S. Patent No. 6,238,944). Applicants respectfully traverse this rejection.

The Examiner rejected claims 6-12 and 20-26 under 35 U.S.C. § 103(a) as being unpatentable over Olbright in view of Floyd. Applicants respectfully traverse this rejection.

35 U.S.C. § 112 Rejection

The Examiner rejected claims 4, 5, and 13-31 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Specifically, with respect to claim 4 and 18, the Examiner asserts that the limitation "alternating layers of pairs of aluminum gallium arsenide layers" is vague and indefinite. Claims 4 and 18 have been amended to clarify that it is alternating layers of aluminum gallium arsenide and aluminum arsenide.

Specifically, with respect to claim 13, the Examiner asserts that the limitation "said device" does not have sufficient antecedent basis. Claim 13 has been amended to refer to "said laser", which Applicant asserts does have antecedent basis.

Specifically, with respect to claim 14, the Examiner asserts that the limitation "a laser resulting from the method of claim 1" is vague and indefinite and fails to provide any structural limitations to properly conform the laser structure. Applicant respectfully requests that the

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Examiner clarify this rejection so that Applicant can reply or amend the claim to address the Examiner's concern.

Specifically, with respect to claim 15, the Examiner asserts that the elements "a substrate", "a dielectric mirror", and "an implanted region" do not provide any structural connections to properly conform the laser structure. Although Applicants in no way concede the correctness of this rejection, claim 15 has been amended to more fully clarify the claimed subject matter.

Specifically, with respect to claim 28, the Examiner asserts that the limitation "said semiconductor Distributed Bragg Reflector stack" does not have sufficient antecedent basis. Claim 28, as well as claim 32, which included this phrase, have been amended to clarify that this phrase refers to said bottom semiconductor Distributed Bragg Reflector stack.

Based on the amendments made to the claims, and the remarks offered above, Applicant respectfully requests that this rejection be withdrawn.

35 U.S.C. § 102 Rejections

The Examiner rejected claims 1-5, 13, 15-19, and 27 under 35 U.S.C. § 102(b) as being anticipated by Olbright (U.S. Patent No. 5,283,447). Although this rejection has not been raised with respect to the newly amended claims, it will be addressed to the extent that it may be applied.

The Examiner asserts, with respect to claims 1 and 15, that Olbright shows a laser comprising a substrate with epitaxial layers and an aperture area, a dielectric mirror, and an implanted region. The Examiner also asserts that claim 1 recites method steps for manufacturing the vertical cavity surface emitting laser device of independent claims 15, 28, and 32, and that such method steps are inherent as a product by process from the apparatus provided by Olbright. The Applicant respectfully disagrees with the Examiner's characterization of Olbright.

With respect to claims 1-5 and 13, the Applicant asserts that the **device** that is disclosed in Olbright cannot be used to anticipate Applicant's **method** claims. Instead, the method steps, as discussed in Olbright should be considered. Applicant respectfully asserts that although other steps of the claimed method may not be disclosed by Olbright, at least the step of "implanting regions of the epitaxially grown layers bordering said aperture area, wherein said remaining

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portion of said dielectric material and said liftoff layer serve as an implantation guide" is not disclosed therein. Olbright does not contain specific discussion regarding how ion implantation is carried out, and certainly does not disclose or suggest that the ion implantation is in any way accomplished with the aide of the partially transmissive mirror. Furthermore, based on the depictions of the confinement regions (163' in Fig. 6, 183' in Fig. 8, 343' in Fig. 11, and 423' in Fig. 13) with respect to the mirrors (161 in Fig. 6, 181 in Fig. 8, 341 in Fig. 11, and 421 in Fig. 13), which the Examiner alleges are comparable to the dielectric mirror of Applicant's invention, it is clear that the partially transmissive mirrors of Olbright are not utilized as a guide for ion implantation because the confinement regions extend into what would be considered the laser are of Applicant's invention. Olbright generally refers to U.S. Pat. No. 4,949,350 at col. 4, lines 55-62, for methods of fabricating the devices. U.S. Pat. No. 4,949,350 also does not offer specific methods for carrying out ion implantation, and certainly does not disclose or suggest that the top DBR mirror be utilized as a guide to ion implantation. Because Olbright does not disclose at least the step of "implanting regions of the epitaxially grown layers bordering said aperture area, wherein said remaining portion of said dielectric material and said liftoff layer serve as an implantation guide", it does not anticipate newly amended claims 1-5 and 13.

With respect to claims 15-19 and 27, Applicants respectfully assert that these claims are not anticipated by Olbright because the ion implantation region is not bordering said laser area as is contemplated and claimed in Applicant's invention. Specifically, Applicant's direct the Examiner's attention to the depictions of the confinement regions (163' in Fig. 6, 183' in Fig. 8, 343' in Fig. 11, and 423' in Fig. 13) with respect to the mirrors (161 in Fig. 6, 181 in Fig. 8, 341 in Fig. 11, and 421 in Fig. 13). As can be seen there, the confinement regions are not bordering the laser area (as it would be defined in that device) but impinge upon the laser area. Therefore, Olbright does not anticipate newly amended claims 15-19 and 27. Withdrawal of the anticipation rejection of claims 1-5, 13, 15-19, and 27 over Olbright is respectfully requested in light of the above amendments and remarks.

The Examiner rejected claims 28-32 under 35 U.S.C. § 102(a) as being anticipated by Floyd (U.S. Patent No. 6,238,944). Although this rejection has not been raised with respect to the newly amended claims, it will be addressed to the extent it is maintained. The Examiner asserts that Floyd teaches a vertical cavity surface emitting laser that comprises a substrate, a

bottom semiconductor DBR stack, an active region, a top semiconductor DBR stack, and a dielectric mirror.

Applicants newly amended claim 28 requires that the dielectric mirror be positioned directly upon said top semiconductor DBR stack. Floyd does not disclose a device having this structure, and therefore does not anticipate the newly amended claims. Floyd also does not disclose that the implantation regions border the laser area as is contemplated by the claims. As discussed at column 4, lines 15-22, the current confinement regions in Floyd are formed by depositing a silicon nitride layer which is photolithographically formed into a capping mask. The capping mask overlies the disordered regions [124] for current confinement. As seen in Figure 1 of Floyd, the disordered region 124 does not encompass the entire region below the dielectric mirror 130 and the implantation region would impinge upon the laser area. Therefore, the implanted regions do not border the laser area as is contemplated by the claims. Withdrawal of the anticipation rejection of claims 28-32 over Floyd is respectfully requested in light of the above amendments and remarks.

35 U.S.C. § 103(a) Rejection

The Examiner rejected claims 6-12 and 20-26 under 35 U.S.C. § 103(a) as being unpatentable over Olbright in view of Floyd. The Examiner asserts that it would have been obvious to a person of ordinary skill in the art to combine the top semiconductor DBR stack of Floyd with the laser structure taught by Olbright. Applicant asserts that the Examiner has failed to make out a *prima facie* case of obviousness.

In order to establish *prima facie* obviousness, three basic criteria must be met, namely: (1) there must be some suggestion or motivation to combine the references or modify the reference teaching; (2) there must be a reasonable expectation of success; and (3) the reference or references when combined must teach or suggest each claim limitation. Applicants submit that the Office Action failed to state a *prima facie* case of obviousness, and therefore the burden has not properly shifted to Applicants to present evidence of nonobviousness.

Applicant asserts that even if there were motivation or suggestion to combine and a reasonable expectation of success, which Applicant does not concede, the combination of the references do not teach or suggest each claim limitation. Claims 6-12 require a step of "

implanting regions of the epitaxially grown layers bordering said aperture area, wherein said remaining portion of said dielectric material and said liftoff layer serve as an implantation guide". Neither Olbright nor Floyd discloses or suggests such a step. Similarly, with respect to claims 20-26, neither Olbright nor Floyd contemplates implantation regions that border the laser area.

Because neither Olbright, Floyd, nor the combination thereof disclose or suggest all of the limitations of the currently pending claims, Applicant respectfully requests that the rejection under 35 U.S.C. § 103(a) be withdrawn.

Conclusion

In view of the amendments and comments presented herein, favorable reconsideration in the form of a Notice of Allowance is respectfully requested.

Respectfully submitted,

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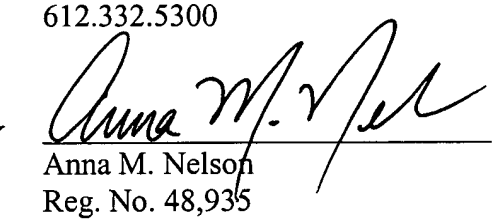

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

Paragraph beginning at page 4, line 26 and ending at page 4, line 27 has been amended as follows:

FIGs. 3 through [10] 11 illustrate a fabrication method and resulting device in accordance with one aspect of the invention.

In the Claims

Claims 1, 4, 13, 15, 16, 18, 28, and 32 have been amended as follows.

1. (Amended) A method of fabricating a laser, said method comprising the steps of:

(a) depositing a photoresist on epitaxially grown layers;

(b) patterning said photoresist to form an aperture area;

(c) depositing a dielectric material on said patterned photoresist;

(d) depositing a liftoff layer on said dielectric material;

(e) removing portions of said dielectric material and liftoff layer that border said aperture area;

(f) implanting regions of the epitaxially grown layers bordering said aperture area, wherein said remaining portion of said dielectric material and said liftoff layer serve as an implantation guide; and

(g) depositing a metal layer on said dielectric material.

4. (Amended) The method of claim 3, wherein said top semiconductor Distributed Bragg Reflector stack comprises alternating layers [of pairs] of aluminum gallium arsenide, and aluminum arsenide [layers].

13. (Amended) The method of claim 1, wherein said [device] laser is a vertical cavity surface emitting laser.

15. (Amended) A laser comprising:

a substrate; [comprising epitaxial layers]

a laser area positioned upon said substrate [and an aperture area];

a dielectric mirror [formed] positioned upon [on top of] said [aperture] laser area; and

an implanted region [within said substrate, said implanted region] bordering said [aperture] laser area.

16. (Amended) The laser of claim 15, wherein said [epitaxial layers] laser area comprise a bottom semiconductor Distributed Bragg Reflector stack, an active region and a top semiconductor Distributed Bragg Reflector stack.

18. (Amended) The laser of claim 17, wherein said top semiconductor Distributed Bragg Reflector stack has alternating layers of [pairs of] aluminum gallium arsenide and aluminum arsenide [layers].

28. (Amended) A vertical cavity surface emitting laser comprising:

a substrate;

a bottom semiconductor Distributed Bragg Reflector stack;

an active region comprising an aperture where light is emitted;

a top semiconductor Distributed Bragg Reflector stack; and

a dielectric mirror positioned directly on said top semiconductor Distributed Bragg Reflector stack over said aperture of said active region

wherein said bottom semiconductor Distributed Bragg Reflector stack and said top semiconductor Distributed Bragg Reflector stack comprise epitaxial layers and said bottom semiconductor Distributed Bragg Reflector stack comprises more epitaxial layers than said top semiconductor Distributed Bragg Reflector stack.

32. (Amended) A vertical cavity surface emitting laser comprising:

a substrate;

a bottom semiconductor Distributed Bragg Reflector stack;

an active region comprising an aperture area where light is emitted;

a top semiconductor Distributed Bragg Reflector stack;

an implanted region within said substrate, said implanted region bordering said aperture area; and

a dielectric mirror positioned directly on said top semiconductor Distributed Bragg Reflector stack over said aperture area of said active region, said dielectric mirror functioning as a guide to form said implanted region,

wherein said bottom semiconductor Distributed Bragg Reflector stack and said top semiconductor Distributed Bragg Reflector stack comprise epitaxial layers and said bottom semiconductor Distributed Bragg Reflector stack comprises more epitaxial layers than said top semiconductor Distributed Bragg Reflector stack.